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MEGAPOLI: concept and first results of multi-scale modelling of megacity impacts

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The European FP7 project MEGAPOLI: 'Megacities: Emissions, urban, regional and Global Atmospheric POLlution and climate effects, and Integrated tools for assessment and mitigation' (http://megapoli.info), started in October 2008, brings together 27 leading European research groups from 11 countries, state-of-the-art scientific tools and key players from countries outside Europe to investigate the interactions among megacities, air quality and climate. MEGAPOLI bridges the spatial and temporal scales that connect local emissions, air quality and weather with global atmospheric chemistry and climate.

The main MEGAPOLI objectives are:
1. to assess impacts of megacities and large air-pollution hot-spots on local, regional and global air quality,
2. to quantify feedbacks among megacity air quality, local and regional climate, and global climate change,
3. to develop improved integrated tools for prediction of air pollution in megacities.

In order to achieve these objectives the following tasks are realizing:
• Develop and evaluate integrated methods to improve megacity emission data,
• Investigate physical and chemical processes starting from the megacity street level, continuing to the city, regional and global scales,
• Assess regional and global air quality impacts of megacity plumes,
• Determine the main mechanisms of regional meteorology/climate forcing due to megacity plumes,
• Assess global megacity pollutant forcing on climate,
• Examine feedback mechanisms including effects of climate change on megacity air quality,
• Develop integrated tools for prediction of megacity air quality,
• Evaluate these integrated tools and use them in case studies,
• Develop a methodology to estimate the impacts of different scenarios of megacity development on human health and climate change,
• Propose and assess mitigation options to reduce the impacts of megacity emissions.

We follow a pyramid strategy of undertaking detailed measurements in one European major city, Paris, performing detailed analysis for 12 megacities with existing air quality datasets and investigate the effects of all megacities on climate and global atmospheric chemistry.

The project focuses on the multi-scale modelling of interacting meteorology and air quality, spanning the range from emissions to air quality, effects on climate, and feedbacks and mitigation potentials. Our hypothesis is that megacities around the world have an impact on air quality not only locally, but also regionally and globally and therefore can also influence the climate of our planet. Some of the links between megacities, air quality and climate are reasonably well-understood. However, a complete quantitative picture of these interactions is clearly missing. Understanding and quantifying these missing links is the focus of MEGAPOLI.

The current status and modeling results after the first project year on examples of Paris and other European megacities are discussed.